

**FIGURE 63.1015-4
ALTERNATE COMPONENT PACKAGE
ACP TABLE C**

Part C1: Maximum Window Area / Gross Exterior Wall Area						
Exterior Wall U_o	Shading Coefficient Range SC_x	U_o Range				
		0.60 to 0.56	0.55 to 0.51	0.50 to 0.46	0.45 to 0.41	≤ 0.40
≤ 0.06	0.80 - 0.71	0.20	0.21	0.22	0.22	0.23
	0.70 - 0.61	0.22	0.23	0.24	0.25	0.26
	0.60 - 0.51	0.23	0.25	0.26	0.27	0.29
	0.50 - 0.41	0.25	0.27	0.29	0.30	0.32
	≤ 0.40	0.27	0.29	0.32	0.34	0.37
0.061 to 0.070	0.80 - 0.71	0.19	0.20	0.21	0.22	0.23
	0.70 - 0.61	0.21	0.22	0.23	0.24	0.25
	0.60 - 0.51	0.22	0.24	0.25	0.26	0.28
	0.50 - 0.41	0.24	0.26	0.27	0.29	0.31
	≤ 0.40	0.26	0.28	0.30	0.33	0.35
0.071 to 0.080	0.80 - 0.71	0.18	0.19	0.20	0.21	0.22
	0.70 - 0.61	0.20	0.21	0.22	0.23	0.24
	0.60 - 0.51	0.21	0.23	0.25	0.26	0.27
	0.50 - 0.41	0.23	0.25	0.26	0.28	0.30
	≤ 0.40	0.25	0.27	0.29	0.31	0.34
0.081 to 0.090	0.80 - 0.71	0.17	0.18	0.19	0.20	0.21
	0.70 - 0.61	0.19	0.20	0.21	0.22	0.23
	0.60 - 0.51	0.20	0.22	0.23	0.24	0.26
	0.50 - 0.41	0.22	0.23	0.25	0.27	0.29
	≤ 0.40	0.24	0.26	0.28	0.30	0.33

Part C2: Other Criteria
Roof Max $U_o = 0.049$
Wall and Ceiling Adjacent to Unconditioned Space Max $U_o = 0.11$
Floor Over Unconditioned Space Max $U_o = 0.040$
Wall Below Grade Min R-Value = 11

Part C3: Unheated Slab-On-Grade Minimum R-Value			
Insulation	Length of Insulation		
Orientation	24"	36"	48"
Horizontal	R=18	R=15	R=11
Vertical	R=8	R=6	R=4

For SI: 1 inch = 25.4 mm.

(6) Thermal resistance value for slab-on-grade floors.

- (a) Unheated slab-on-grade floors shall have insulation around the perimeter of the floor with the thermal resistance (R_u) of the insulation as listed in the appropriate ACP table given in Figures 63.1019-1 to 63.1019-4.
- (b) For heated slabs-on-grade, the required minimum R -value shall be the R -value for the unheated slab-on-grade plus 2.0.
- (c) The slab insulation specified shall extend either in a vertical plane downward from the top of the slab for the minimum distance given in the appropriate ACP table or downward to the bottom of the slab then in a horizontal plane beneath the slab or outward from the building for the minimum distance given in the ACP table. Vertical insulation shall not be required to extend below the foundation footing.
- (d) The R -value and dimensions required for slabs refer only to the building insulation materials. Insulative continuity shall be maintained in the design of slab edge insulation systems. Continuity shall be maintained from the wall insulation through the intersection of the slab, wall and footing to the body of the slab edge insulation.

Comm 63.1016 System standards option. To comply with the system standards for building envelope thermal performance, the building shall comply with section 8.6 of ASHRAE standard 90.1 or with the system analysis design specified in IECC Section 806 applied to the thermal envelope alone. Building site climate data shall be determined using Wisconsin division of state energy statistics or other source acceptable to the department.

Note: Section 8.6 of the ASHRAE 90.1 Standard requires use of the latest version of the ENVSTD computer program, which is the computer program included in the ASHRAE 90.1 Standard to evaluate an envelope tradeoff.

Note: ComCheck-EZ is a computer program that may be used only for determining building envelope compliance. The ComCheck-EZ computer program may be downloaded at: <http://www.energycodes.gov/>. The federal Department of Energy has issued a computer package called ComCheck-Plus, which establishes tradeoffs between the building envelope, lighting, and HVAC equipment; however, this program has not been approved for use in Wisconsin since Wisconsin's lighting allowances are not the same as those included in the program.

Comm 63.1017 Design criteria.

(1) Thermal performance.

- (a) Except as provided in par. (b), the thermal performance values for the exterior envelope of buildings or areas of buildings that are warehouses that meet the criteria of s. Comm 63.1014 (2)(b), or that are factories shall not exceed the values in Table 63.1017-1. The calculation procedures of s. Comm 63.1019 shall be used to show compliance.
- (b) The thermal performance values specified in par. (a) may be increased or decreased provided the U -value for other components is decreased or increased so the total heat gain or loss for the entire building envelope and floor area does not exceed

the total heat gain or loss resulting from conformance to the values specified in this section.

**TABLE 63.1017-1
THERMAL PERFORMANCE VALUES**

NUMBER OF STORIES	THERMAL PERFORMANCE VALUES*
1-2	12
3-4	13
5-7	16
8-12	18
13-20	20
Over 20	21

*Expressed in Btu/hour/square foot of above-grade exterior envelope. See s. Comm 63.1023 (2) and (3) for design conditions.

- (2) **Floors over unconditioned spaces.** The overall heat transmission coefficient (U -value) for floors of heated or mechanically cooled spaces over unconditioned spaces shall not exceed 0.08 Btu/h · ft² · °F.
- (3) **Slab-on-grade perimeter insulation.** For slab-on-grade floors with or without a grade beam, a foundation bearing wall or a foundation frost wall, the thermal resistance of the insulation around the perimeter of the floor shall not be less than the values shown in Table 63.1017-2. The insulation shall extend 48 inches (1219 mm) in the vertical or horizontal direction or combination thereof with a total dimension of 48 inches (1219 mm). Slab-on-grade perimeter insulation shall be moisture resistant.

**TABLE 63.1017-2
PERIMETER INSULATION REQUIREMENTS^a**

Slab-on-grade Perimeter Insulation	Zone 1	Zone 2	Zone 3	Zone 4
$R = \frac{^{\circ}\text{F} \cdot \text{ft}^2 \cdot \text{Hour}}{\text{Btu}}$				
Unheated Slabs	6.7	6.2	5.9	5.2
Heated Slabs ^b	9.3	9.0	8.6	8.2

a. See Fig. 63.1023 for zone definitions.

b. Heated slabs have piping, duct work or other heat distribution system components embedded in or under them.

Comm 63.1018 Material properties.

- (1) **ASHRAE fundamental data.** Except as specified in sub. (2), when available, information on thermal properties, performance of building envelope sections, and components and heat transfer shall be obtained from *ASHRAE Handbook of Fundamentals*.
- (2) **Exceptions.**
 - (a) **Laboratory or field test measurements.** When the information is not available from *ASHRAE Handbook of Fundamentals*, the data may be obtained from laboratory or field-test measurements. If laboratory or field-test measurements are used for envelope heat transmission, they shall be obtained using one of the following test methods:

1. For envelope assemblies containing metal framing, the U_i shall be determined by using one of the following methods:

- Using results from laboratory or field-test measurements where one of the procedures specified in s. Comm 63.1018 is used.
- Using the thermal resistance of those roof and wall assemblies listed in Tables 63.1019-1 and 63.1019-2 shall be corrected using the following parallel path correction factor procedure:

Considering the total resistance of the series path:

$$U_i = 1/R_i$$

$$R_i = R_s + R_e$$

where:

R_i = The total resistance of the envelope assembly.

R_s = The resistance of the series elements (for $i = 1$ to n) excluding the parallel path element(s).

R_e = The equivalent resistance of the element containing the parallel path, the value of R_e is:

$$R_e = R\text{-value of insulation} \times F_c$$

The Parallel Path Correction Factors (F_c) may be obtained from tests conducted using procedures listed in s. Comm 63.1018. Parallel Path Correction Factors for some envelope assemblies are listed in Tables 63.1019-1 and 63.1019-2.

- For elements with internal metallic structures bonded on one or both sides to a metal skin or covering, the calculation procedure specified in the ASHRAE *Handbook of Fundamentals*, or specified in ASHRAE standard 90.1, or other procedure acceptable to the department shall be used to include the effects of thermal bridges in metal construction.
- For elements other than those covered above, the zone method described in the ASHRAE *Handbook of Fundamentals* shall be used for calculation.

**TABLE 63.1019-1
ROOFS
PARALLEL PATH CORRECTION FACTORS^a**

Bridged R-Value	0	5	10	15	20	25	30	35	40	45	50	55
Correction Factor	1.0	0.96	0.92	0.88	0.85	0.81	0.79	0.76	0.73	0.71	0.69	0.67

For SI: 1 inch = 25.4 mm.

a. Table values are based upon metal trusses with 4-foot spacing that penetrate the insulation, and 0.66-inch-diameter cross members every 1 foot.

**TABLE 63.1019-2
WALL SECTIONS WITH METAL STUDS
PARALLEL PATH CORRECTION FACTORS**

Size of Members	Gauge of Stud ^a	Spacing of Framing, in.	Cavity Insulation R-Value	Correction Factor	Effective Framing/Cavity R-Values
2 × 4	18-16	16 o.c.	R-11	0.50	R-5.5
			R-13	0.46	R-6.0
			R-15	0.43	R-6.4
2 × 4	18-16	24 o.c.	R-11	0.60	R-6.6
			R-13	0.55	R-7.2
			R-15	0.52	R-7.8
2 × 6	18-16	16 o.c.	R-19	0.37	R-7.1
			R-21	0.35	R-7.4
2 × 6	18-16	24 o.c.	R-19	0.45	R-8.6
			R-21	0.43	R-9.0
2 × 8	18-16	16 o.c.	R-25	0.31	R-7.8
2 × 8	18-16	24 o.c.	R-25	0.38	R-9.6

For SI: 1 inch = 25.4 mm.

a. These factors can be applied to metal studs of this gauge or thinner.

2. For assemblies containing nonmetal framing, the U_i shall be determined from one of the laboratory or field-test measurements specified in s. Comm 63.1018 or from the ASHRAE series-parallel method. Formulas in the ASHRAE *Handbook of Fundamentals*, shall be used for these calculations.
3. The opaque portions of doors shall be considered to be a part of the opaque wall assembly in the calculation of the average thermal transmittance. The thermal transmittance of the entire opaque door assembly including the frame shall be included in the calculation.

(b) **Thermal transmittance of fenestration.** Values of U_{gf} shall be determined using one of the following methods:

1. The National Fenestration Rating Council (NFRC) 100 Procedure for Determining Fenestration Product U-Factors. The thermal performance values shall be certified through the NFRC Fenestration Thermal Performance Rating Certification and Labeling Program as described in the NFRC Product Certification Program LAP 1, PCP 1, and CAP 1.
2. The values for the appropriate product type given in IECC Table 102.5.2 (1) may be used.

Note: In order to use the component standards option of s. Comm 63.1015, the U -value of fenestration must be 0.60 or less.

(4) **Gross area of envelope components.**

- (a) **Roof assembly.** The gross area of a roof assembly consists of the total surface of the roof assembly exposed to outside air or unconditioned spaces. The roof assembly shall be considered to include all roof or ceiling components through which heat may flow between indoor and outdoor environments including skylight surfaces but excluding service openings. For thermal transmittance purposes when return air ceiling plenums are employed, the roof or ceiling assembly shall not include the resistance of the ceiling or the plenum space as part of the total resistance of the assembly.
- (b) **Floor assembly.** The gross area of a floor assembly over outside or unconditioned spaces consists of the total surface of the floor assembly exposed to outside air or unconditioned space. The floor assembly shall include all floor components through which heat may flow between indoor and outdoor or unconditioned space environments.
- (c) **Exterior walls.** The gross area of exterior walls enclosing a heated or cooled space is measured on the exterior and consists of the opaque wall including between floor spandrels, peripheral edges of flooring, window areas including sash, and door areas, but excluding vents, grilles, and pipes.

- (5) **Shading coefficients.** The shading coefficient (SC_x) for fenestration shall be obtained from the ASHRAE *Handbook of Fundamentals* or from manufacturer's test data or from IECC Section 102.5.2. SC_x is the shading

coefficient of the fenestration including permanently installed internal and external shading devices but excluding the effect of external shading projections, which is calculated separately. The shading coefficient used for louvered shade screens shall be determined using a profile angle of 30 degrees as found in the ASHRAE *Handbook of Fundamentals*.

PART 4 EQUIPMENT AND SYSTEMS

Comm 63.1020 Minimum equipment efficiencies.

- (1) Space heating or cooling equipment that is not covered by 10 CFR Part 430, Energy Conservation Program for Consumer Products, shall have a minimum efficiency at the specified rating conditions not less than the values given in ASHRAE 90.1, section 10.4.1.
- (2) Equipment ratings shall be certified under a nationally recognized certification program or rating procedure or by data furnished by the equipment manufacturer to show compliance with the minimum efficiency requirements.

Note: The following certification programs are accepted by the department: Gas Appliance and Manufacturers Association (GAMA) and Air-Conditioning and Refrigeration Institute (ARI).

- (3) Compliance with minimum efficiency requirements specified for HVAC equipment shall include compliance with part-load requirements where indicated as well as standards for full-load requirements. The part-load efficiency shall be determined as specified in ASHRAE 90.1.
- (4) Space heating or cooling equipment used to provide additional functions, such as water heating for plumbing, as part of a combination or integrated system shall comply with minimum performance requirements for the appropriate space heating or cooling equipment category.
- (5) Equipment providing water heating for plumbing that is used to provide additional functions, such as space heating, as part of a combination or integrated system shall comply with minimum performance requirements for water heating equipment as specified in s. Comm 84.20 (5) (n).
- (6) Combination space and plumbing water heating equipment shall comply with IECC Section 504.2.2.

Note: See ch. Comm 64 for additional requirements for combined systems.

- (7) Equipment that is not used for comfort cooling or comfort heating is exempt from the energy efficiency requirements of this chapter.

Note: Omission of minimum performance requirements for certain classes of HVAC equipment does not preclude use of that equipment.

Comm 63.1021 Field-assembled equipment and components. When components, such as indoor or outdoor coils, from more than one manufacturer are used as parts of air-conditioning or heating equipment, component efficiencies shall be specified based on data provided by the component manufacturers.

**TABLE 63.1029-1
MINIMUM DUCT SEAL LEVEL^a**

DUCT LOCATION	DUCT TYPE			
	Supply		Exhaust	Return
	≤ 2 in. w.c. ^b (500 Pa)	> 2 in. w.c. ^b (500 Pa)		
Outdoors ^c	A	A	C	A
Unconditioned Spaces	B	A	C	B
Conditioned Spaces	C	B	B	C

a. See Table 63.1029-2 definition of Seal Class.

b. Duct design static pressure classification.

c. Includes indirectly conditioned spaces, such as return air plenums.

**TABLE 63.1029-2
DUCT SEAL CLASSES**

DUCT SEAL CLASS	SEALING REQUIREMENTS ^a
A	All transverse joints, longitudinal seams, and duct wall penetrations. Pressure-sensitive tape shall not be used as the primary sealant.
B	All transverse joints and longitudinal seams. Pressure-sensitive tape shall not be used as the primary sealant.
C	Transverse joints only.

a. Longitudinal seams are joints oriented in the direction of airflow. Transverse joints are connections of two duct sections and are oriented perpendicular to airflow. Duct wall penetrations are openings made by any screw fastener, pipe, rod or wire. Spiral lock seams in round and flat oval ducts need not be sealed. All other connections are considered transverse joints, including but not limited to spin-ins, taps and other branch connections, access door frames and jambs, and duct connections to equipment.

- (f) The motor is not a multispeed motor used in a system designed to use more than one speed.
- (g) The motor is not a component of equipment that meets the efficiency requirements of s. Comm 63.1020 where motor input is included in the determination of the equipment efficiency.

- (2) **Motor nameplate.** The motor nameplate shall list the minimum nominal full-load motor efficiency.

Note: Motors that are classified as “energy efficient” under the National Electric Manufacturer’s Association Standard MG 12.55, dated 3-14-91, are acceptable to the department as meeting the efficiency requirements of this section.

PART 5 LIGHTING POWER

Comm 63.1040 Scope.

- (1) **General.** Except as specified in sub. (2), sections Comm 63.1041 to 63.1051 shall apply to all of the following rooms, spaces and areas:
 - (a) Interior spaces of buildings.
 - (b) Building exteriors and exterior areas such as entrances, exits, and loading docks.
 - (c) Roads, grounds, parking, and other exterior areas where lighting is energized through the building electrical service.
- (2) **Exceptions.** Lighting that is specifically designated as required by a health or life safety regulation is exempt.

Comm 63.1041 Exterior lighting power requirement. The exterior lighting power of a building or a group of buildings in a multibuilding facility calculated in accordance with s. Comm 63.1042 shall be no greater than the lighting power allowance calculated in accordance with s. Comm 63.1043.

Comm 63.1042 Calculation of exterior lighting power. The calculated exterior lighting power is the sum of the power for all exterior luminaires that are included in s. Comm 63.1040, minus the power for exempted exterior lighting as specified in subs. (1) to (5).

- (1) Task lighting for outdoor activities such as manufacturing and processing facilities.
- (2) Lighting power for theatrical productions.
- (3) Lighting for outdoor sporting facilities, including playing and seating areas.
- (4) Lighting for dwelling units that is controlled within the dwelling unit.
- (5) Exit way or egress lighting required by IBC Section 1003.2.11 that has switching regulated by Article 700 of the *National Electrical Code*.

Comm 63.1043 Exterior lighting power allowance.

- (1) **Calculation method.** The exterior lighting power allowance for a building or a multibuilding facility is the sum of all the allowed lighting powers for all exterior areas. The lighting power for each area is calculated by multiplying the unit power allowance from Table 63.1043 by the applicable length or area.
- (2) **Applicable areas and lengths.** The applicable areas and lengths used with Table 63.1043 to calculate the exterior lighting power allowance are described in pars. (a) to (d).
 - (a) Horizontal areas of grounds, driveways, lots, gardens or parks may be calculated as if they were flat, or the actual area of the surfaces of contours may be used.

TABLE 63.1032
MINIMUM ACCEPTABLE NOMINAL FULL-LOAD MOTOR EFFICIENCY FOR SINGLE-SPEED POLYPHASE SQUIRREL-CAGE INDUCTION
MOTORS HAVING SYNCHRONOUS SPEEDS OF 3,600, 1,800, 1,200 AND 900 RPM

Full-Load Efficiencies—Open Motors								
HP	2-Pole		4-Pole		6-Pole		8-Pole	
	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency
1.0	—	—	82.5	81.5	80.0	78.5	74.0	72.0
1.5	82.5	81.5	84.0	82.5	84.0	82.5	75.5	74.0
2.0	84.0	82.5	84.0	82.5	85.5	84.0	85.5	84.0
3.0	84.0	82.5	86.5	85.5	86.5	85.5	86.5	85.5
5.0	85.5	84.0	87.5	86.5	87.5	86.5	87.5	86.0
7.5	87.5	86.5	88.5	87.5	88.5	87.5	88.5	87.5
10.0	88.5	87.5	89.5	88.5	90.2	89.5	89.5	88.5
15.0	89.5	88.5	91.0	90.2	90.2	89.5	89.5	88.5
20.0	90.5	89.5	91.0	90.2	91.0	90.2	90.2	89.5
25.0	91.0	90.2	91.7	91.0	91.7	91.0	90.2	89.5
30.0	91.0	90.2	92.4	91.7	92.4	91.7	91.0	90.2
40.0	91.7	91.0	93.0	92.4	93.0	92.4	91.0	90.2
50.0	92.4	91.7	93.0	92.4	93.0	92.4	91.7	91.0
60.0	93.0	92.4	93.6	93.0	93.6	93.0	92.4	91.7
75.0	93.0	92.4	94.1	93.6	93.6	93.0	93.6	93.0
100.0	93.0	92.4	94.1	93.6	94.1	93.6	93.6	93.0
125.0	93.6	93.0	94.5	94.1	94.1	93.6	93.6	93.0
150.0	93.6	93.0	95.0	94.5	94.5	94.1	93.6	93.0
200.0	94.5	94.1	95.0	94.5	94.5	94.1	93.6	93.0
Full-Load Efficiencies—Enclosed Motors								
HP	2-Pole		4-Pole		6-Pole		8-Pole	
	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency
1.0	75.5	74.0	82.5	81.5	80.0	78.5	74.0	72.0
1.5	82.5	81.5	84.0	82.5	85.5	84.0	77.0	75.5
2.0	84.0	82.5	84.0	82.5	86.5	85.5	82.5	81.5
3.0	85.5	84.0	87.5	86.5	87.5	86.5	84.0	82.5
5.0	87.5	86.5	87.5	86.5	87.5	86.5	85.5	84.0
7.5	88.5	87.5	89.5	88.5	89.5	88.5	85.5	84.0
10.0	89.5	88.5	89.5	88.5	89.5	88.5	88.5	87.5
15.0	90.2	89.5	91.0	90.2	90.2	89.5	88.5	87.5
20.0	90.2	89.5	91.0	90.2	90.2	89.5	89.5	88.5
25.0	91.0	90.2	92.4	91.7	91.7	91.0	89.5	88.5
30.0	91.0	90.2	92.4	91.7	91.7	91.0	91.0	90.2
40.0	91.7	91.0	93.0	92.4	93.0	92.4	91.0	90.2
50.0	92.4	91.7	93.0	92.4	93.0	92.4	91.7	91.0
60.0	93.0	92.4	93.6	93.0	93.6	93.0	91.7	91.0
75.0	93.0	92.4	94.1	93.6	93.6	93.0	93.0	92.4
100.0	93.6	93.0	94.5	94.1	94.1	93.6	93.0	92.4
125.0	94.5	94.1	94.5	94.1	94.1	93.6	93.6	93.0
150.0	94.5	94.1	95.0	94.5	95.0	94.5	93.6	93.0
200.0	95.0	94.5	95.0	94.5	95.0	94.5	94.1	93.6